

RATIONAL FUNCTION - the quotient of two polynomials

$$f(x) = \frac{N(x)}{D(x)}$$

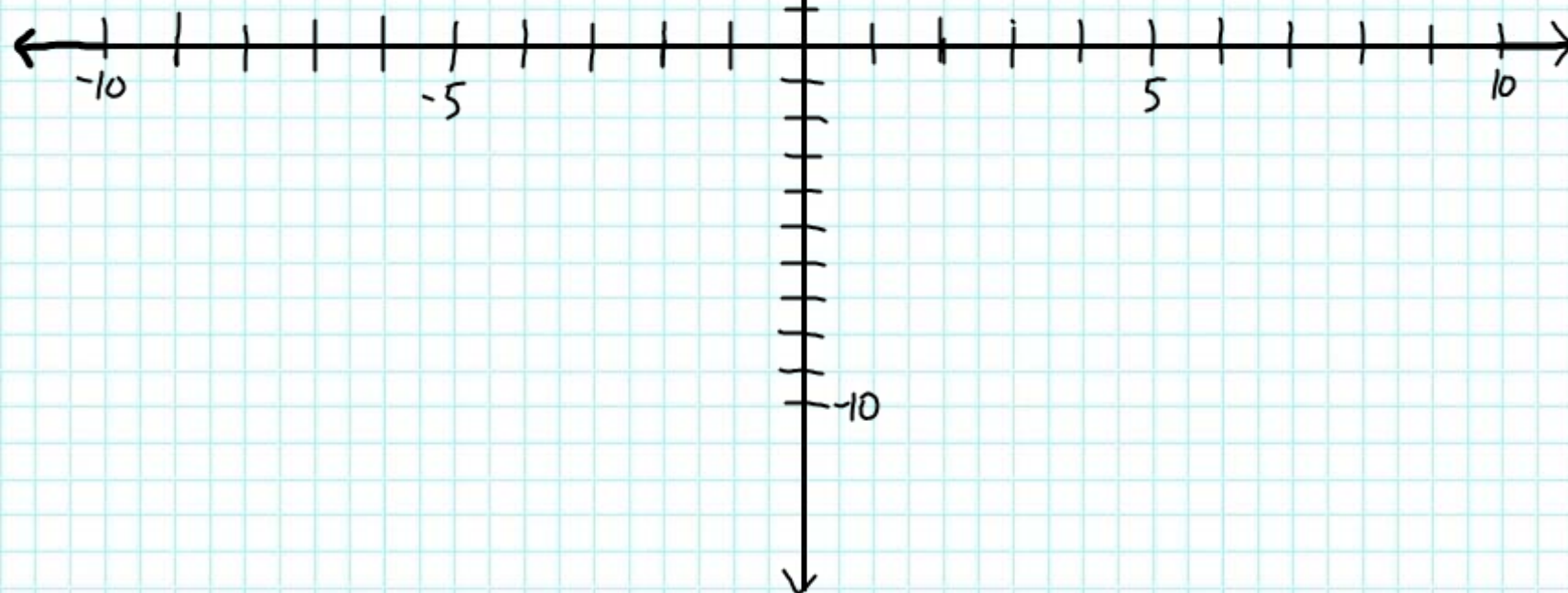
Domain

All  $x$ , such that  $D(x) \neq 0$

Basic function  $f(x) = \frac{1}{x}$

$x$	0	0.01	0.1	1	10	100
$f(x)$						

$x$	-100	-10	-1	-0.1	-0.01	0
$f(x)$						



$$f(x) = \frac{N(x)}{D(x)}$$

and  $n = \text{degree of top polynomial}$   
 $m = \text{degree of bottom polynomial}$

VERTICAL ASYMPTOTES — occur when  $D(x) = 0$

E.g.  $f(x) = \frac{1}{x-3}$  has V.A. at  $x=3$

## HORIZONTAL ASYMPTOTES

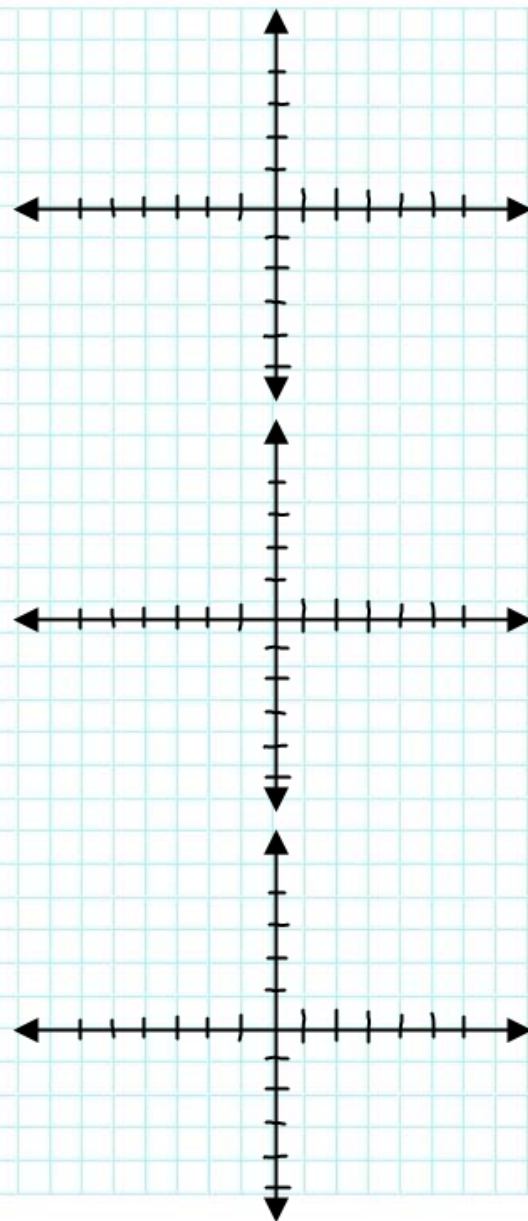
- ① If  $n < m$  (top degree less than bottom degree), then asymptote is  $y = 0$
- ② If  $n = m$  (top degree = bottom degree), then asymptote is the ratio of leading coefficients.
- ③ If  $n > m$  (top degree > bottom degree), then there is no horizontal asymptote

## Examples

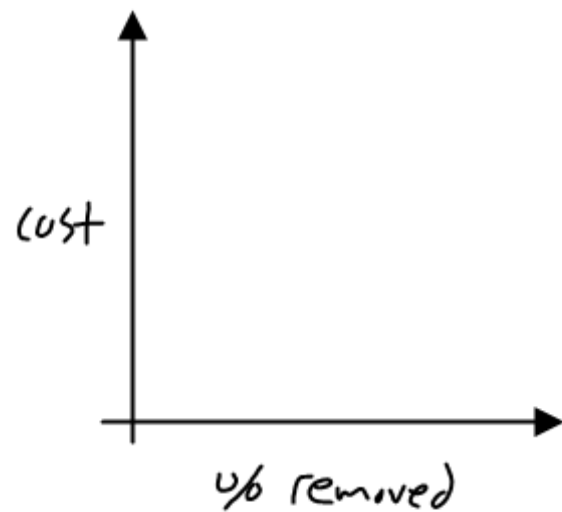
$$\textcircled{1} f(x) = \frac{2x+1}{x+1}$$

$$\textcircled{2} f(x) = \frac{2x}{3x^2+1}$$

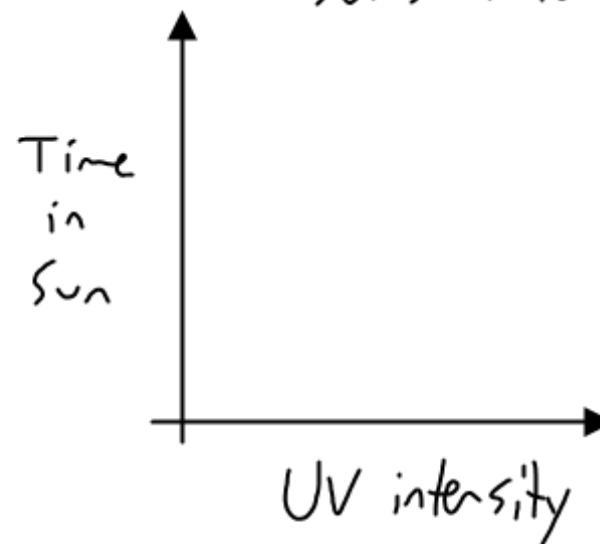
$$\textcircled{3} f(x) = \frac{2x^2}{x^2-1}$$



Cost of cleaning pollutants  
out of a smokestack



The time a person can  
spend in the sun w/o  
burning depends on the  
sun's intensity



## SECTION 2.6

# 1-6 (b+c only), 7-12, 13-21 (odd), 23